

THE  
GEORGE WASHINGTON UNIVERSITY  
National College of Pharmacy

ANNOUNCEMENT FOR 1914-1915

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UNIVERSITY OF ILLINOIS  
JUN 16 1917

ALBANY, N. Y. 1917

COLLEGE CALENDAR.—The Forty-Third Annual Session of the College will begin on Wednesday, September 23, 1914, and close on Wednesday, June 9, 1915.

MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	SATURDAY.
FRESHMEN.		JUNIORS.		SENIORS.	
<b>Botany.</b> Lectures & Recitations. 10-11 A. M. <b>Pharmacy.</b> Lectures & Recitations. 11 A. M.-12 M. Recess, 12 M.-12:30 P. M. <b>Pharmacy.</b> Laboratory Work. 12:30-4:30 P. M.		<b>Botany and Materia Medica.</b> Lectures & Recitations. 10-11 A. M. <b>Pharmacy.</b> Lectures & Recitations 11 A. M.-12 M. Recess, 12 M.-12:30 P. M. <b>Pharmacy.</b> Laboratory Work. 12:30-4:30 P. M.		<b>Materia Medica and Toxicology.</b> Lectures & Recitations. 10-11 A. M. <b>Pharmacy.</b> Lectures & Recitations. 11 A. M.-12 M. Recess, 12 M.-12:30 P. M. <b>Pharmacy.</b> Laboratory Work. 12:30-4:30 P. M.	
MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	SATURDAY.
JUNIORS.	SENIORS.	FRESHMEN.	SENIORS.	JUNIORS.	
<b>Physics and General Chemistry.</b> Lectures & Recitations. 6-7 P. M. <b>Analytical Chemistry</b> Lectures, Recitations and Laboratory Work. 7-11:30 P. M.	<b>Microscopy.</b> Lectures and Practice. 6-8 P. M. <b>Mercantile Pharmacy</b> Sept. 29-Jan. 26 Lectures and Practice 8-10 P. M. <b>Pharmaceutical Jurisprudence</b> Feby. 2 to End of Term. 8-9 P. M.	<b>Physics and General Chemistry.</b> Lectures & Recitations. 6-7 P. M. <b>Analytical Chemistry</b> Lectures, Recitations and Laboratory Work. 7-11:30 P. M.	<b>General and Organic Chemistry.</b> Lectures & Recitations. 6-7 P. M. <b>Quantitative Chemical Analysis</b> Lectures, Laboratory Work and Recitations. 7-11:30 P. M.	<b>Microscopy.</b>  Lectures, Laboratory Work and Recitations.  6-8:30 P. M.	

Entrance examination at 1 p. m. on Thursday, September 17, 1914, in the Lecture-room of the College. Annual examination of Freshmen and Juniors for promotion and of Seniors for graduation begins on May 10, 1915.

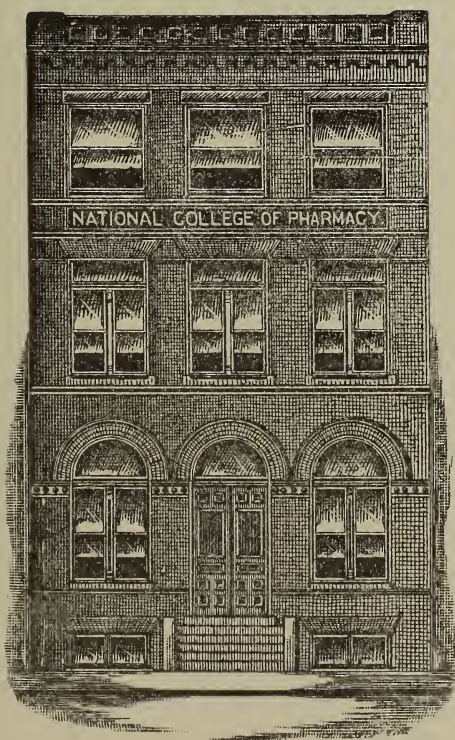
1914—November 26, a holiday; no College exercises. December 21 last lecture before Christmas vacation. 1915—January 4, lectures resume.

February 22, a Holiday. June 9, graduation day; College closes.

THE  
GEORGE WASHINGTON UNIVERSITY  
National College of Pharmacy

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ANNOUNCEMENT FOR 1914-1915



Forty-Third Annual Session

808 I STREET, N. W.

WASHINGTON D. C.

## MEMBERS OF THE COLLEGE.

WALTER ARMSTRONG  
 PHILIP J. AFFLECK  
 THOMAS H. ATKINSON  
 HOMER K. BUTLER  
 GEORGE W. BOYD.  
 W. EDWARD BOYD.  
 WILLIAM D. BRACE.  
 WYMOND H. BRADBURY.  
 ALFRED T. BRONAUGH.  
 HOWARD M. BRADBURY.  
 ROBERT F. BOGGAN  
 LOUIS F. BRADLEY  
 WILLARD D. BOYER.  
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 FRED B. CAMPBELL.  
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 FRANCIS M. CRISWELL.  
 WILLIAM C. DOWNEY.  
 PETER J. DUNCAN  
 ROGER W. DUFFEY  
 C. F. W. DAMMEYER.  
 HERBERT C. EASTERDAY  
 JAMES K. EPPLEY.  
 RALPH W. FELLER.  
 HENRY EVANS.  
 W. ASHTON EVANS  
 MARTIN S. FEALY.  
 LEWIS FLEMER.  
 HENRY B. FLOYD.  
 LEOPOLD H. FORSTER.  
 CHARLES J. FUHRMANN.  
 MALCOLM G. GIBBS.  
 T. LEITH GILL.  
 CHARLES E. GROSS.  
 CHARLES B. GASS.  
 CHARLES E. GILLETTE.  
 ROBERT N. HARPER.  
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 FRANK C. HENRY.  
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 SAMUEL L. HILTON.  
 R. CLIFFORD HINES.  
 JAMES T. HOSKINS.

FLORENCE V. HOSKINS  
 CHARLES HAWKINS.  
 R. VERNON HOUSTON  
 WALTER R. HILL  
 S. J. HOHBERGER.  
 JOHN R. JACOBS  
 WILLIAM S. JONES.  
 T. A. T. JUDD.  
 WILLIAM P. KENEALY  
 HENRY E. KALUSOWSKI.  
 LYMAN F. KEBLER.  
 WILLIAM T. KERFOOT.  
 CHARLES G. LENNON.  
 WILLIAM H. McCLURE  
 GEO. T. MANKIN.  
 J. WILLARD McCHESNEY.  
 T. K. MELSON.  
 WILLIAM F. MATTINGLY  
 GUY M. NEELY.  
 GAIL E. NELSON.  
 ROBERT C. NELLIGAN.  
 THOMAS E. OGRAM.  
 PAUL PEARSON.  
 R. LUCIEN QUIGLEY.  
 ALBERT M. READ (Honorary)  
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 W. S. RICHARDSON.  
 EARLE K. RICHARDSON  
 SAMUEL A. RICHARDSON  
 HARRY C. SNYDER.  
 H. E. SPRUCEBANK.  
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 FRANK B. TIPTON  
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 ROBERT A. VEITCH.  
 MARTIN I. WILBERT  
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 EDWARD W. WHITESIDE  
 CHARLES WHITEBREAD.  
 CHARLES S. WALTER  
 CONRAD H. WEISS

OFFICERS AND COMMITTEES  
OF  
NATIONAL COLLEGE OF PHARMACY.

SESSION OF 1914-1915.



President.

CHARLES H. STOCKTON, LL. D.

Dean and Chairman.

HENRY E. KALUSOWSKI.

Vice-Chairman.

LEWIS FLEMER

Secretary.

WYMOND H. BRADBURY.

Treasurer.

H. C. EASTERDAY.

TRUSTEES,

With date of expiration of term of office.

CHARLES B. CAMPBELL, 1917.  
HERBERT C. EASTERDAY, 1917.  
LEWIS FLEMER, 1917.  
WILLARD S. RICHARDSON, 1917.  
FRANK C. HENRY, 1915.  
SAMUEL L. HILTON, 1915.

HENRY E. KALUSOWSKI, 1915.  
WILLIAM T. KERFOOT, Jr. 1915.  
WYMOND H. BRADBURY, 1916.  
SAMUEL M. WAGNER, 1916.  
CHARLES E. GROSS, 1916.  
FRANK P. WELLER, 1916.

STANDING COMMITTEES.

Finance and Business.

WILLARD S. RICHARDSON.

WILLIAM T. KERFOOT, JR.

CHARLES B. CAMPBELL.

Pharmaceutical Education and Conduct of School of Pharmacy.

HENRY E. KALUSOWSKI.  
LEWIS FLEMER.

A. C. TAYLOR.

SAMUEL L. HILTON  
FRANK P. WELLER.

U. S. Pharmacopœia and Progress of Pharmacy.

SAMUEL L. HILTON.

H. E. KALUSOWSKI.

LEWIS FLEMER.

National Formulary.

MARTIN I. WILBERT.

A. N. CONNER

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Publications, Library and Cabinet.

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## FACULTY

HENRY E. KALUSOWSKI, M. D., PHAR. D., DEAN,  
Professor of Pharmacy.

HENRY H. HAZEN, B. S., M. D.,  
Professor of Materia Medica, Botany and Toxicology

HERBERT H. BUNZEL, S. B., PH. D.,  
Professor of Chemistry and Physics.

HOWARD M. BRADBURY, PHAR. D.,  
Professor of Analytical Chemistry.

BURTON J. HOWARD, B. S.,  
Professor of Microscopy.

ALEXANDER MUNCASTER, PHAR. D., LL. B., LL. M.,  
Professor of Pharmaceutical Jurisprudence

HENRY B. FLOYD, PHAR. D.,  
Professor of Mercantile Pharmacy.

DOUGLAS TSCHIFFELY, PHAR. D.,  
Assistant to the Professor of Pharmacy

HOMER K. BUTLER, PHAR. D.,  
HENRY W. GEORGE.,  
Assistants to the Professors of Chemistry.



## BOARD OF EXAMINERS

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HENRY H. HAZEN.

HOWARD M. BRADBURY.

FRANK P. WELLER.

HERBERT H. BUNZEL.

HENRY B. FLOYD.

# THE GEORGE WASHINGTON UNIVERSITY NATIONAL COLLEGE OF PHARMACY

No. 43

WASHINGTON, D. C.

1914-1915

THE NATIONAL COLLEGE OF PHARMACY, of Washington, D. C., was organized and began teaching November 11, 1872.

In February, 1906, it became a member of the educational system of The George Washington University under the charter of the University granted by Congress March 3, 1905, providing for the organization of colleges. The President of the University is *ex-officio* President of the National College of Pharmacy, and the College is represented in the President's Council by its Dean.

The official title of the College now is THE GEORGE WASHINGTON UNIVERSITY NATIONAL COLLEGE OF PHARMACY.

## COLLEGE BUILDING.

The College building is centrally located on I Street, Northwest, between 8th and 9th Streets. It is easily reached by any street car line of the city.

## LOCAL ADVANTAGES.

Washington is the most attractive and beautiful city in the country, as well as one of the most healthful. Its extensive Libraries, Museums, and Botanical Gardens are open to Students every day except Sunday. The facilities thus afforded for studying Botany and Materia Medica are unequaled anywhere.

## PRELIMINARY EDUCATION AND EXAMINATION

The college requires of its Matriculants a knowledge of the branches usually taught in the public schools of Washington, D. C. to the extent of *three years in the high school or its equivalent*, and they shall be at least seventeen years of age. *Beginning with the session of 1916-17 four years High School or the equivalent will be required.* Evidence of which may be shown by certificates from reputable teachers or by the results of an examination to be held at the college, at one o'clock p. m., THURSDAY, September 17, 1914.

## THREE YEARS' STUDY REQUIRED BEFORE GRADUATION.

The progress made in the sciences and arts directly affecting the practice of Pharmacy, and the widely diversified knowledge required to keep the pharmacist in touch with the results of modern research, have made an extension of the course of instruction necessary. Students entering the College will therefore be required to take a course of study covering a period of three years before they will be entitled to an examination for graduation. Upon entry students will be assigned to the first or Freshman Class, from which, after passing satisfactory examinations, they will be admitted to the Junior and Senior Classes at the end of the first and second scholastic years respectively.

# MATERIA MEDICA, BOTANY AND TOXICOLOGY

PROF. HENRY H. HAZEN

## FRESHMAN COURSE

Introduction to the study of Botany, Evolution, Properties of Living Organisms, Growth of Plants, Internal Structure and Physiology of Plants will receive proper attention, followed by a description of the Natural and Artificial Systems of Botany.

Following will be a course of instruction in Animal Physiology, to include Body Tissues, Bone, Fibre, Cartilage, Muscle, Epithelium, Serous Tissue, Nerve Tissue, Blood and the Circulation.

## JUNIOR COURSE

Causes of disease, Trauma, Poisons introduced from without, the Bacteria, Immunity.

General Principles of Therapeutics, Rules for Dosage, Standardization of Drugs, to be followed in their regular order, the study of Drugs, classified according to their general or local effects.

## SENIOR COURSE

General review of the Junior year work and continuation of the study of drugs, to include the coal tar group, toxins and anti-toxins vaccines, Bacterins. Use of drugs hypodermically. This course to conclude with a special course of instruction in Toxicology.



## PHARMACY

PROF. HENRY E. KALUSOWSKI

DOUGLAS TSCHIFFELY

Assistant

This course will be devoted to the study of the various pharmaceutical processes and operations. The opening lecture will define Pharmacy and state its relations to the arts and sciences; in the order named will follow lectures on Metrology, Heat, Thermometry, Evaporation, Distillation, Fusion, Sublimation, Calcination, Granulation, Comminution, Solution, Filtration, Clarification, Decoloration, Precipitation, Crystallization and Extraction, during which the various methods used to bring about the desired results will be explained and illustrated.



## JUNIOR COURSE.

The first part of this course will be taken up with the study of official preparations obtained from the mineral kingdom, beginning with Bromine, Chlorine, Iodine, Phosphorus and Sulphur, and followed in the order named by Carbon, Boron, Silicon, the inorganic acids, Potassium, Sodium, Lithium, Ammonium, Magnesium, Calcium, Barium, Zinc, Aluminum, Cerium, Cadmium, Manganese, Iron, Chromium, Lead, Silver, Copper, Mercury, Antimony, Arsenic, Bismuth, and Gold. The second part of this course will be followed by a study of Fixed Oils and Fats, Volatile Oils, Alkaloids, Glucosides, their sources and separation, and animal products.

## SENIOR COURSE.

The time during this course will be mainly given to the study of compounds chiefly derived from organic matter, such as Cellulose and products obtained therefrom, Amylaceous, Mucilaginous and Saccharine substances; Soaps, Resinoids and products from resins, to be followed by a systematic instruction in compounding and dispensing prescriptions.

In addition to oral quizzes, students in all classes will be examined at regular periods by a series of written questions covering the subject-matter of previous lectures.



## ANALYTICAL CHEMISTRY.

PROF. HOWARD M. BRADBURY.

HOMER K. BUTLER, Assistant.

The instruction in this department is intended to present to the student the chemical tests of the United States Pharmacopœia; to familiarize him with methods for the identification of substances and for the detection of impurities; to instruct him in the methods of assaying and the use of volumetric solutions, and to enable him to analyze any ordinary mixture of inorganic material.

The course of instruction embraces three years of practice in the chemical laboratory and class-room exercises.

For the purpose of carrying out the work of this department a large, well-equipped laboratory is provided having drawer and locker accommodations for one hundred and twenty students and desk space for forty students working together at one time. The laboratory is provided with the usual water and gas facilities, and has been wired and installed with electric apparatus whereby electro-chemical methods of analysis can be taught and the application of the electric current to the preparation of chemicals by the methods of electro-chemistry can be illustrated before the students. The laboratory is also provided with ample hood facilities for keeping the atmosphere of the room free as possible from deleterious fumes, and is equipped with means for giving an ample supply of distilled water. These and other facilities afford students exceptional opportunities to become familiar with the fundamental principles of the science of chemistry.

The first year is devoted to experimental work so arranged as to supplement the lectures in General Chemistry. The student attains a knowledge of elementary principles, becomes familiar with manipulating apparatus, and is prepared to commence analytical work.

The second year covers a systematic course in Qualitative Analysis in connection with the tests of the United States Pharmacopœia.

The third year is devoted to Volumetric Analysis by means of the standard solutions of the Pharmacopœia.

## GENERAL CHEMISTRY AND PHYSICS

PROF. HERBERT H. BUNZEL

HENRY W. GEORGE, Assistant.

The subjects of Analytical Chemistry and Pharmacy being fully provided for in other courses, the exercises in General Chemistry will be primarily devoted to a rational presentation of the fundamental principles and classification which must underlie a thorough and systematic knowledge of Chemistry. Because of the intimate connection existing between Chemistry and several branches of Physics, a number of lectures illustrating the more important laws and principles of some of these branches will precede the regular course in Chemistry. In order that the exercises in General Chemistry and in Analytical Chemistry may be perfectly corollated during the first year, these preliminary lectures in Physics have been equally divided between the two courses. Aside from the Physics the first year will be devoted to the detailed study of the most common elements and the more fundamental chemical theory.

In the second year the subjects of Light, Magnetism and Electricity, with special reference to their chemical, and, in the case of Light, microscopical application are treated in the first four lectures, the remainder of the year being devoted to the study of the elements in groups, based upon Mendeleeff's classification.

The third year will be devoted to the exposition of the more important facts, principles, and theories of Organic Chemistry, including descriptions of the more important compounds; as well as of the larger classes and groups, both of the fatty and aromatic series, which latter are gaining an ever wider use and importance in Pharmacy. The value of an acquaintance by the pharmacist with the simplest elements of Physiological Chemistry is so great that two or three lectures devoted to their elucidation are given at the close of the third year.

Quizzes will be heard frequently throughout the three years, in order to test and apply the students' knowledge and to stimulate their interest in the various subjects.

# MICROSCOPY

## PROF. BURTON J. HOWARD

The course of Microscopy is intended to give instruction in the use of the compound microscope as an aid in the study and identification of drugs. Attendance upon this course is required of Junior and Senior students.

The work will consist of both lectures and laboratory work, the exact details connected with each section of the plan of instruction will be clearly set forth as the course progresses.

The first part of the instruction will include the proper manipulation of the microscope and such features concerning microscopic technique as will be most necessary to students of Pharmacy.

After these studies the work will consist of the examination of plant tissue as illustrated in various vegetable substances most familiar to pharmacists. Special attention will be given to the structural characteristics by which one drug can be distinguished from another as well as the detection and identification of the most common adulterants used.

The importance of a knowledge of starches as a means of identification will involve a study of the most common ones, and will constitute an important feature in the first part of the course. The various parts of the plant organism will then be studied microscopically, using drugs as the basis of material. This will require in some cases the use of fresh material while in others dried samples will be used. Drugs commonly used in the powdered condition will first be examined in the entire state by means of sections, after which the powdered form will be studied.



# MERCANTILE PHARMACY

## PROF. HENRY B. FLOYD

The object of the course in Mercantile Pharmacy is to familiarize the student with modern book-keeping methods capable of practical application to the retail pharmacy; to teach him the law and ethics of business; and to prepare him for the problems which will confront him in the management of a retail drug store.

Single entry book-keeping will be discussed, but the scientific and more satisfactory double entry system will be taught. The conversion of a set of books from single to double entry will be illustrated. Each student will be required to keep a practice set of books, and the work thereon will include opening and closing the same, journalizing, posting, and planning and preparing forms with a view to simplifying the work of book-keeping. Actual practice will be had in making notes, drafts, checks, statements, bills, and other commercial papers and forms.

The lectures, in addition to covering book-keeping methods and commercial and business law (contracts, agency, partnership, corporations; property, insurance, bankruptcy, bills, and notes), will include business correspondence, banking, and business practice. Under the last noted heading, such matters as planning the new store, its stock and its policies; advertising, purchasing and selling methods; and manufacturing will be considered.

Written and oral quizzes will be given from time to time, and at the close of the course a written examination covering the subject matter of the entire course will be held.



## PHARMACEUTICAL JURISPRUDENCE

### PROF. ALEXANDER MUNCASTER

A course of twelve lectures to the Senior Class upon the rights and responsibilities of Pharmacists and the general and special laws bearing upon the practice of Pharmacy.

SYNOPSIS.—Historical sketch of the law in general; Constitution of the United States and State Constitutions; Federal law, with especial reference to the Food and Drugs Act of June 30, 1906, known as the "Pure Food Law," and special acts relating to Pharmacy in the District of Columbia; right to practice Pharmacy and the law in regard to prescribing; liability of retail, wholesale and manufacturing pharmacists for negligence; contributory negligence, etc.

Students will be expected to take notes. The class will be quizzed during the course, and a written examination held at the termination thereof.







A SECTION OF THE PHARMACEUTICAL LABORATORY.

# Syllabus of Lectures and Laboratory Instruction.

NOTE —Students should preserve this Syllabus as a guide to study

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## MATERIA MEDICA, BOTANY AND TOXICOLOGY

PROF. HENRY H. HAZEN.

FRESHMAN COURSE

### BOTANY

1. Introduction. Evolution. Properties of living organisms.
2. How plants grow and their essential parts.
3. How plants grow and their essential parts.
4. Initial structure of plants.
5. The physiology of plants.
6. The physiology of plants.
7. Natural and artificial systems of botany. The Thallophyta.
8. Bryophyta. Pteridophyta.
9. Phanerogamia.
10. Gymnospermae.
11. Angiospermae—Monocotyledons.
12. Angiospermae—Dicotyledons.

### PHYSIOLOGY.

13. The body tissues—Bone, Fibre, Cartilage, Muscle.
14. Epithelium, Serous Tissue, Nerve Tissue, Blood.
15. The circulation.
16. Respiration.
17. Digestion.
18. Digestion.
19. The lymphatic system.
20. The kidneys and reproduction.
21. The nervous system.
22. The skin.
23. The internal secretions.
24. General review.

# PHARMACY

## PROF. HENRY E. KALUSOWSKI

### FRESHMAN COURSE.

1. Pharmacy defined. Description of Pharmacopœias and Dispensatories. Manner of reading formulæ. Historical sketch of the United States Pharmacopœia.

2. Metrology. The principle and construction of various kinds of balances; their care, method of using, testing.

Weighing. Standards of weight and measure; relation to each other.

Measure of Capacity. Testing balances.

Specific Gravity defined. Methods employed, illustrated by practical application to liquids and solids.

Specific volume. Methods for determination illustrated and applied.

3. Heat. Sources from whence obtained; methods for applying; uses in Pharmacy; manner of regulating and modifying intensity by baths.

Methods for Measurement of Heat. Manner of using thermometers. Relation of the various scales.

4. Evaporation, Principle of. Methods for conducting by heat, in vacuo, under pressure, spontaneously; effects of pressure and saturation of air; boiling point; rate and effects of evaporation and removal of products.

5. Distillation. Principle involved in the process. Construction of apparatus. Simple, fractional and destructive distillation. Manner of using distillatory apparatus. Recovery and treatment of distillates.

6. Fusion, Sublimation, Calcination, and Granulation. Principles explained and application to pharmacopœial uses described.

7. Desiccation and Comminution. Principles involved in construction of mills and cutters explained. Mortars and knives described. Garbling and powdering drugs. Sifting to required degree of fineness; considerations governing fineness of powders; effects of pulverization.

8. Solution. Theory of solution. Saturation. Solvents of the United States Pharmacopœia, classified and considered in groups.

9. Filtration. Explained and illustrated by means of various kinds of apparatus and media. Methods for rapid filtration by aid of heat or in the cold. Use of apparatus to produce vacuum; continuous filtration.

Clarification and Decolorization. Methods for and substances used.

10. Precipitation. Theory of changes that take place and conditions required. Decantation; use of siphon; washing and drying precipitates.

11. Crystallization, Systems of. Measurement of crystals; conditions under which crystallization takes place; purification of crystals.

12. Dialysis and Diffusion. Consideration of principles; methods of application and uses.

13. Extraction, General purposes of and common results.

14. Maceration, Decoction and Infusion. Methods for effecting solution described. Official decoctions and infusions. Expression. Purpose of and methods described.

15. Percolation. Theory and principles; manner of preparing drug, menstruum, percolator and receiver; recovery of percolate; treatment of weak percolates; modified methods for percolation; re-percolation described and illustrated.

16. Preparation of aqueous solutions of oils, viscid, mucilaginous, and saccharine substances; cold process for syrups described and illustrated. Official syrups, methods for preparing, description, character of and causes of deterioration.

17. Solutions, Mixtures, and Emulsions. Manner of making and character of compounds described. Glycerites and oleaginous solutions described; manner of preparation illustrated. Vinegars, resins and oleoresins; methods for preparation usually followed illustrated; character and cause of deposits in oleoresins.

18. Alcoholic, Hydro-Alcoholic, Vinous. Ethereal solutions described and methods for preparation demonstrated.

Extracts. Selection of drugs and menstua; methods of concentration; treatment of reserved, concentrated and finished portions; condition and treatment of weak percolates by distillation.

Reviews at the close of the first half of the course and at the end of the last half the course.

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## PHARMACEUTICAL LABORATORY WORK

### FRESHMAN

The plan of instruction in these courses is arranged so as to give each student a thorough and practical knowledge of the various Pharmaceutical Processes, the application of which will be facilitated by an ample supply of material and apparatus to properly carry out the purpose of this course. That the work may be carried on according to a definite plan, it has been divided into sections, each of which is intended to be as nearly complete as the character of the process indicated will admit. *Students are required to complete the work of each section and submit the results to the instructors for approval before they will be permitted to take up any work on the succeeding section.*

1. Students will receive instruction upon the proper use of the Pharmacopœia. By a series of written exercises upon subjects that will be named they will be required to write a description of a number of substances; the order of writing will include the official names, chemical symbols, synonyms, names of the parts or parts used; if a plant, name of natural order, description of substance named, solubility, melting point, tests for identification and names of official substances derived therefrom.

2. Specific Gravity. Methods for taking specific gravity of solids and liquids.

3. Application of heat to determine melting and boiling points, with arrangement of necessary apparatus to carry out a series of trials.

4. Preparation of series of aromatic waters by solution in hot and cold water filtering or otherwise clarifying the same.

5. Distillation. Fitting up distillatory apparatus and applying same for preparing distilled waters, recovering alcohol, and for the preparation of not less than two solutions of gases in water and two aromatic waters.

6. Solution. Applied to the preparation of decoctions and infusions and of syrups mucilages, vinegars, and glycerites.

7. Precipitation, exsiccation and granulation applied to a number of inorganic salts.

8. Percolation, applied to the preparation of a series of products, among which will be included aqueous extracts, hydro-alcoholic extracts and tinctures, with methods for recovery and treatment of alcohol from weak percolates. The preparation of a series of syrups by the "cold process," or percolation, will follow.

9. Upon the conclusion of the course a laboratory examination will be held; this will involve the application of any of the above named processes to the preparation of some product that will be named and material supplied on the date of the examination.



# INTRODUCTORY LABORATORY PRACTICE.

PROF. HOWARD M. BRADBURY

## FRESHMAN COURSE.

1. Phenomena of attraction: Gravitation, weight, center of gravity, cohesion, adhesion, capillarity.
2. Heat: Mechanical motion and heat convertible; temperature; conduction, convection, radiation. Expansion in solids, in fluids; coefficient of expansion; laws of expansion of gases; kinetic theory of gases.
3. Heat *continued*. Specific heat, calorimetry; change of state produced by heat, liquefaction, vaporization, distillation, sublimation. Pressure of vapors. Sources of heat. Dynamical theory of heat.
4. Review.
5. Examination in Physics.
6. Care of apparatus; rules to be observed in laboratory work; importance of recording results and method of recording same; evidences of chemical change and distinction from physical change.
7. Study of the properties of oxygen and methods of preparation. Oxygen produced by heating oxides, such as mercuric oxide and manganese dioxide.
8. Preparation of hydrogen by action of metals on water. Zinc and sulphuric acid. Electrolysis of water. Union of hydrogen with oxygen to form water.
9. Manufacture of soap. Hard and soft water.
10. Experiments with substances containing water of crystallization, and with deliquescent bodies. Hydrogen peroxide.
11. Oxygen continued. Preparation from salts containing oxygen, such as potassium chlorate. Study of the law of definite proportions as illustrated by these reactions, calculations by means of atomic and molecular weights.
12. Reduction of copper oxide by hydrogen. The synthesis of water.
13. Review.
14. Examination in Chemistry.
15. Chlorine. Preparation by the agency of an oxydizing body on a chloride, such as manganese dioxide and sodium chloride in presence of sulphuric acid; properties of chlorine. Preparation from sodium chloride by electrolysis of salt solution, illustrating the commercial production of chlorine by the use of the electric current. Preparation by oxidation of hydrochloric acid with potassium permanganate. Preparation of hydrochloric acid by means of sodium chloride and sulphuric acid.
16. Compounds of chlorine, oxygen and a metal. Action of chlorine on alkali hydrates. Chlorates. Hypochlorites made by electrolysis. Bleaching powder.
17. Acids, bases, salts. Neutralization. Definite quantities of acids and bases unite to form salts. Test papers. Salts formed by the action of acids on metals and oxides.
18. Review.
19. Air. Oxygen and nitrogen in air. Moisture shown by deliquescence. Carbonic acid in air. Chemical changes produced by air.
20. Ammonia. Destructive distillation of substances containing nitrogen. Salts of ammonium in presence of alkalies.
21. Compounds of nitrogen, oxygen and hydrogen. Nitric acid prepared from potassium nitrate and sulphuric acid. Oxidation by nitric acid.
22. Review.
23. Carbon. Occurrence. Amorphous carbon. Carbon as a reducing agent.
24. Compounds of carbon. Carbon dioxide, preparation and detection. Absorption of carbon dioxide by solution of alkali hydroxides. Carbon monoxide by decomposition of oxalic acid. Bunsen burner.



25. Alkali metals. Preparation of sodium carbonate by the LeBlanc method.
26. Alkali metals. Preparation of caustic soda by lime; electrolytic production of caustic soda and chlorine from common salt. Ammonium hydroxide from crude ammonia liquor.
27. Study of elements in groups. Periodic system. Chlorine group.
28. Study of elements in groups continued. Calcium group.
29. Review.
30. Review.

The result of all experiments are required to be recorded in note books, which are criticised each week.

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## GENERAL CHEMISTRY

### PROF. HERBERT H. BUNZEL

#### FRESHMAN COURSE

1. Physical and chemical phenomena. Physical agents. Matter. Molecular theory. Properties of matter. Force. Molar and molecular forces. Different states of aggregation.
2. Dynamics of liquids. Compressibility; pressure and equilibrium; buoyant force; density; capillarity; diffusion; osmose; dialysis; siphon; pumps.
3. Pneumatics: Physical properties of gases, the atmosphere, barometer, compressibility and expansibility of gases; air pump. Gas laws and their application. Diffusion; absorption.
4. Review.
5. Examination in Physics.
6. Chemical change; relations between chemical and physical change. Definition of chemistry. Composition of matter; elements, mixtures, compounds. Chemical action, affinity. Reaction. Analysis; synthesis. The chemical elements and their symbols.
7. Oxygen: Occurrence; preparation. Symbolic expression of reactions, chemical equations. Properties of oxygen. Oxidation, combustion, respiration. Heat of combustion and of decomposition. Chemical energy and chemical work. Oxides.
8. Hydrogen: Occurrence, preparation. Properties of hydrogen; diffusive and penetrative power; diffusion of gases in general; reducing power of hydrogen; combination with oxygen, oxhydrogen blow-pipe.
9. Water: Formation and proof of its composition. Measurement of gases. Properties of water. Consequences of its abnormal expansion and contraction. Expansive force of freezing water. Ice.
10. Water *continued*: Solvent power; mineral waters; sea water. Solution. Water of crystallization, efflorescence, deliquescence, hygroscopicity. Hydrogen dioxide and ozone.
11. Conservation of mass and energy. Laws of definite and multiple proportions. Atomic theory. Atomic and molecular weights. Formulas, their meaning and use.
12. Study of reactions employed in the preparation of oxygen and hydrogen and in the study of water. Classes of chemical reactions.
13. Review.
14. Examination in Chemistry.
15. Chlorine: Occurrence; preparation; properties. Hydrochloric acid.
16. Oxides and oxyacids of chlorine; hypochlorites, chlorates.
17. Acids, bases, neutralization, salts. Chemical nomenclature of compounds. Electrolytes and non-electrolytes.
18. Review.
19. Nitrogen: Occurrence, preparation, properties. The atmosphere; composition, analysis, function.

20. Nitrogen *continued*: Ammonia; its formation and manufacture, properties, uses, composition. Relations between the volumes of combining gases. Relations between the specific gravities of gases and their combining weights. Ammonium salts. Compound radicals.

21. Nitrogen *continued*: Oxides and oxyacids of nitrogen. Nitric acid; its manufacture, properties, uses; fuming nitric acid; aqua regia. Nitrous oxide; nitric oxide; nitrogen trioxide and nitrous acid; nitrogen tetroxide. Chlorides and iodides of nitrogen.

22. Review.

23. Carbon: Occurrence. Allotropy. Diamond, graphite, amorphous carbon. Chemical properties of carbon; reducing power. Compounds with hydrogen. Organic chemistry; petroleum, methane, ethylene, acetylene.

24. Carbon *continued*: Carbon monoxide; carbon dioxide; their occurrence, preparation, properties. Respiration. Carbonic acid and carbonates.

25. Illuminating gas; combustion, flame. Bunsen burner; blow-pipe; miner's lamp. Cyanogen; hydrocyanic acid. Carbon in metallurgy.

26. Review.

27. Avogadro's hypothesis. Relation between specific gravity and molecular weights of gases. Elemental molecules; nascent state. Molecular equations. Determination of formulas. Valence; replacing power of elements.

28. Methods of determining molecular weights and atomic weights. The different classifications of the elements. The Mendeleeff classification. Principal elements in each group.

29. Review.

30. Review.

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## MATERIA MEDICA, BOTANY AND TOXICOLOGY

PROF. HENRY H. HAZEN.

### JUNIOR COURSE.

1. The Causes of Disease. Trauma. Poisons introduced from without. The Bacteria.
2. Bacterial infection. Immunity. Animal parasites.
3. Diseases due to improper functioning of organs.
4. General principles of Therapeutics. Rules for dosage. Specific drug therapy.
5. Continuation of lecture 4. Standardization of drugs.
6. } Corrosives or caustics.
7. }
8. } Disinfectants and antiseptics.
9. }
10. Astringents and styptics.
11. Emollients.
12. Local anodynes.
13. Flavoring substances.

14. Digestives.
15. Emetics.
16. Cathartics.
17. Drugs to lessen movements of the intestines.
18. Anthelmintics and intestinal antiseptics.
19. Drugs to increase blood pressure and strengthen heart.
20. Drugs to lower blood pressure.
21. Diuretics.
22. Urinary antiseptics.
23. Ecboics.
24. Drugs to stimulate respiratory center.

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## PHARMACY

PROF. HENRY E. KALUSOWSKI

### JUNIOR COURSE

1. Chlorine, Bromine, Iodine, Phosphorus and Sulphur. History, sources, process of production, methods of preparation of officinal compounds, tests for identification.
2. Carbon, Boron and Silicon. Compounds used in Pharmacy and the methods of production.
3. Acids. Preparation, tests, impurities, purification, and pharmacopœial uses; use of hydrometers and specific gravity tables for determining strength thereof.
4. Potassium, Sodium, Lithium and Ammonium. Sources of supply, methods of producing and purifying, pharmacopœial compounds, tests for identity, and composition.
5. Magnesium, Calcium, and Barium. Sources of supply, production of compounds, methods for purification, tests and uses in Pharmacy.
6. Zinc, Aluminum, Cerium and Cadmium. Sources of supply, methods of obtaining the elements, formation of compounds, impurities, tests for identity and composition.
7. Manganese, Iron and Chromium. Methods for obtaining pharmacopœial compounds from these elements, characteristics of, processes of purification, tests for; identity and composition; scale salts of iron, their character and preparation.
8. Lead, Copper, Silver and Mercury. Sources of supply, manner of production, characteristics of; pharmacopœial compounds obtained from these elements, tests for purity and identification.
9. Antimony and Arsenic. Sources, production of salts, methods for testing. Toxicology; antidotes and methods of administration.
10. Bismuth. Preparation of pharmacopœial compounds; impurities, separation of; tests.
11. Gold. Notice of officinal compounds; methods for testing.
12. Fixed Oils and Fats; their composition, methods for production and purification, keeping and dispensing. Tests for adulteration, saponification and iodine absorption values demonstrated.
13. Alkaloids and Glucosides, Sources of. Methods for separation, character, tests for identification, remarks on dispensing and antidotes, followed by drugs containing neutral, cathartic and astringent principles.

14. Animal Products. Fats, oils, lactic acid, anti-diphtheric serum. Powdered glandular substances. Pepsin. Pancreatin. Preparation and methods of testing.

Reviews at the close of the first half of the course and at the end of the last half of the course.

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## PHARMACEUTICAL LABORATORY WORK.

### JUNIOR.

1. Preparation and standardization of the following solutions:

Half normal hydrochloric acid solution.

Normal potassium hydrate solution. Decinormal silver nitrate solution.

Half normal alcoholic potass hydroxide Tenth normal potass permanganate solution.

Decinormal iodine V. S. Decinormal sodium hyposulphite solution.

Normal sulphuric acid.

Quantitative and qualitative tests of the following inorganic compounds will be made:

2. Acids. Hydrochloric, Nitric, Phosphoric, Sulphuric, Acetic, Tartaric and Citric.

3. Chlorinated lime, Iodine.

4. Potassium and Sodium hydrates, Potassium bitartrate and iodide, Potassium and sodium tartrate.

5. Sodium bicarbonate, borate, bromide and phosphate. Ammonia water.

6. Iron reduced. Sol. Chloride iron, Citrate iron and quinine.

7. Solution Subacetate lead, Silver nitrate.

8. Antimony and potassium tartrate, Arsenous acid.

9. Determination of the purity of a series of fixed oils and fats by chemical tests, finding of saponification numbers and iodine absorption values.

10. Identification and tests for their purity of some of the commonly used "synthetics".

11. Quantitative assays of opium, nux vomica, Belladonna and preparations of alkaloid containing drugs.

Upon the conclusion of the foregoing a laboratory examination will be held. It will consist of problems involved in any of the above numbered sections; the problems will be announced on the date of the examination.

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## ANALYTICAL CHEMISTRY.

### QUALITATIVE ANALYSIS.

### PROF. HOWARD M. BRADBURY.

#### JUNIOR COURSE.

1. Qualitative analysis; description of operations and apparatus used in analysis; terms defined.

2. Classification of the elements for qualitative analysis; classification of the elements for other purposes.

3. Bases divided into groups by means of reagents. Alkali group: Potassium, sodium, ammonium, lithium.

4. Symbols, formulæ, and equations used in recording the results of analysis. Preliminary reactions of the calcium group: Barium, calcium, strontium and magnesium.

5. Calcium group continued. Equations explanatory of the chief reactions; study of the group by the scheme of analysis.

6. Iron and zinc groups. Preliminary reactions with reagents, such as alkali hydrates, carbonates, sulphides, phosphates, &c., with the metals of this group.

7. Iron and zinc group continued. Writing equations under this group; study of the group by means of the scheme of analysis.



8. Iron and zinc group continued. Analysis and identification of the members of the group in presence of phosphates and interfering substances.

9. Copper group, division B. Preliminary reactions with test substances; writing equations.

10. Copper group, division B, continued. Study of group by the scheme of analysis.

11. Tin group (arsenic, antimony and tin). Preliminary reactions with test substances; study of the methods of separating arsenic and antimony.

12. Tin group continued. Separation from the copper group; analysis and identification by the scheme; equations.

13. Silver group. Tests and analysis by the scheme; equations.

14. Separation of the groups of metals and the identification of members in each group.

15, 16, 17. Continued drill on the use of the scheme of analysis for the detection of unknown elements.

18. Acid-forming elements. Acids—monobasic, dibasic, tribasic; theory of their structure; tests for sulphides, carbonates, nitrates, sulphates, sulphites.

19. Analysis of salts of unknown metals combined with hydrosulphuric, carbonic, nitric, sulphuric and sulphurous acids.

20. Acids continued. Tests for halogen acids—hydrochloric, hydrobromic, hydriodic—and their separation.

21. Analysis of salts of unknown metals combined with the halogen acids.

22. Halogen acids continued. Tests for hydrocyanic, hydroferro- and hydroferri-cyanic acids and their separation from each other.

23. Analysis of salts containing metals in combination with preceding acids.

24. Hydrochlorous, chloric, boracic and hydrofluoric acids.

25. Acids of phosphorus, hypophosphorous, phosphoric, pyro- and metaphosphoric acids.

26. Final review of the schemes of analysis.

27. Practical laboratory examination.

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## GENERAL CHEMISTRY.

PROF. HERBERT H. BUNZEL.

### JUNIOR COURSE.

1. Light; its nature, sources, velocity; reflection; mirrors; refraction; total reflection; prisms; spectra; etc.

2. Light continued: Lenses; images; chromatic and spherical aberration; compound microscope; undulatory theory; color phenomena.

3. Magnetism: its nature, production, peculiarities and uses. Frictional and dynamical electricity; induction, potential, electro-chemical decomposition, electro-chemical series, cell, battery, etc.

4. Dynamical electricity continued: Electrolysis and the ion theory; secondary batteries; electrical measurements; dynamos; physiological effects of electricity; application in medicine.

5. Review classification of the elements. Study of elements in natural groups based on the Mendeleeff classification, beginning with the more non-metallic elements.

Group VII: The halogens. Review chlorine. Bromine and iodine; their common occurrence, methods of preparation, properties, uses, and their important salts. Fluorine and hydrofluoric acid. Comparison of these elements.

6. Group VI: Review oxygen. Sulphur. Occurrence, preparation, properties, allotropic forms, uses. Crystallography, dimorphism and polymorphism. Hydrogen sulphide.

7. Sulphur continued: Oxides of sulphur. Sulphurous and sulphuric acids. Commercial manufacture, purification, properties and uses of sulphuric acid. Other acids of sulphur. Carbon bisulphide. Selenium and tellurium. General remarks on the group.



8. Group V: Review nitrogen. Phosphorus; occurrence, preparation, properties, etc. Hydrides; hypophosphorous acid and hypophosphites. Common oxides of phosphorous and corresponding acids.

9. Group V. *continued*: Arsenic; occurrence, preparation, etc. Hydrides, oxides, acids, sulphides, etc. Detection of arsenic in cases of poisoning. Antimony and Bismuth. Comparative summary of the group.

10. Group IV: Review Carbon. Silicon, tin and lead: Occurrence, preparation, etc.; their comparative physical and chemical properties; important compounds and their application, etc.

11. Group III: Boron and aluminum; occurrence, preparation, etc. boric oxide and acid; borax, etc. The alums, clays, etc. Rare earth metals.

12. The more metallic elements: Group I. Sub-group: the alkali metals. Sodium and potassium; their occurrence, preparation, etc. Important compounds; their manufacture, properties, uses, etc.

13. The alkali metals *continued*: Lithium, cassium, rubidium. Summary of this sub-group. The radical ammonium; ammonium amalgam; ammonium compounds; etc.

14. Group II. Sub-group: the alkaline earth metals; calcium typical of the group; its occurrence, preparation, etc.; its important compounds; phosphate fertilizers; glass; mortar; cement; etc.

15. The alkaline earth metals *continued*: Strontium and barium compared with calcium. Spectrum analysis. Specific heat and atomic heat of solid elements; their application.

16. Group II: Sub-group: magnesium, zinc, cadmium, and mercury. Magnesium and zinc; their occurrence, preparation; common salts, etc.

17. The magnesium group *continued*: Cadmium and mercury; their occurrence preparation; important compounds; amalgams; etc.

18. Group I: Sub-group: copper, silver and gold; their occurrence, metallurgy, properties; important salts; uses; etc. The platinum metals.

19. The iron group: Iron; its ores and metallurgy; cast iron, steel and wrought iron; salts of iron, their properties and uses. Nickel and cobalt.

20. Manganese and chromium; important compounds and their application. Molybdenum, tungsten and uranium.

21. Other sessions will include quiz and review-periods at appropriate intervals; also mid-year and final examinations.

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## MICROSCOPY

PROF. BURTON J. HOWARD

JUNIOR COURSE.

[NOTE.—The following syllabus will give some idea as to the character and order of studies for the Junior Course, though it may be found necessary to change the order as well as some of the illustrative matter:]

1. Optics of microscopes: Refraction of light, simple lenses, chromatic aberration, spherical aberration.

2. Forms of simple magnifiers. The compound microscope. Types of objectives,

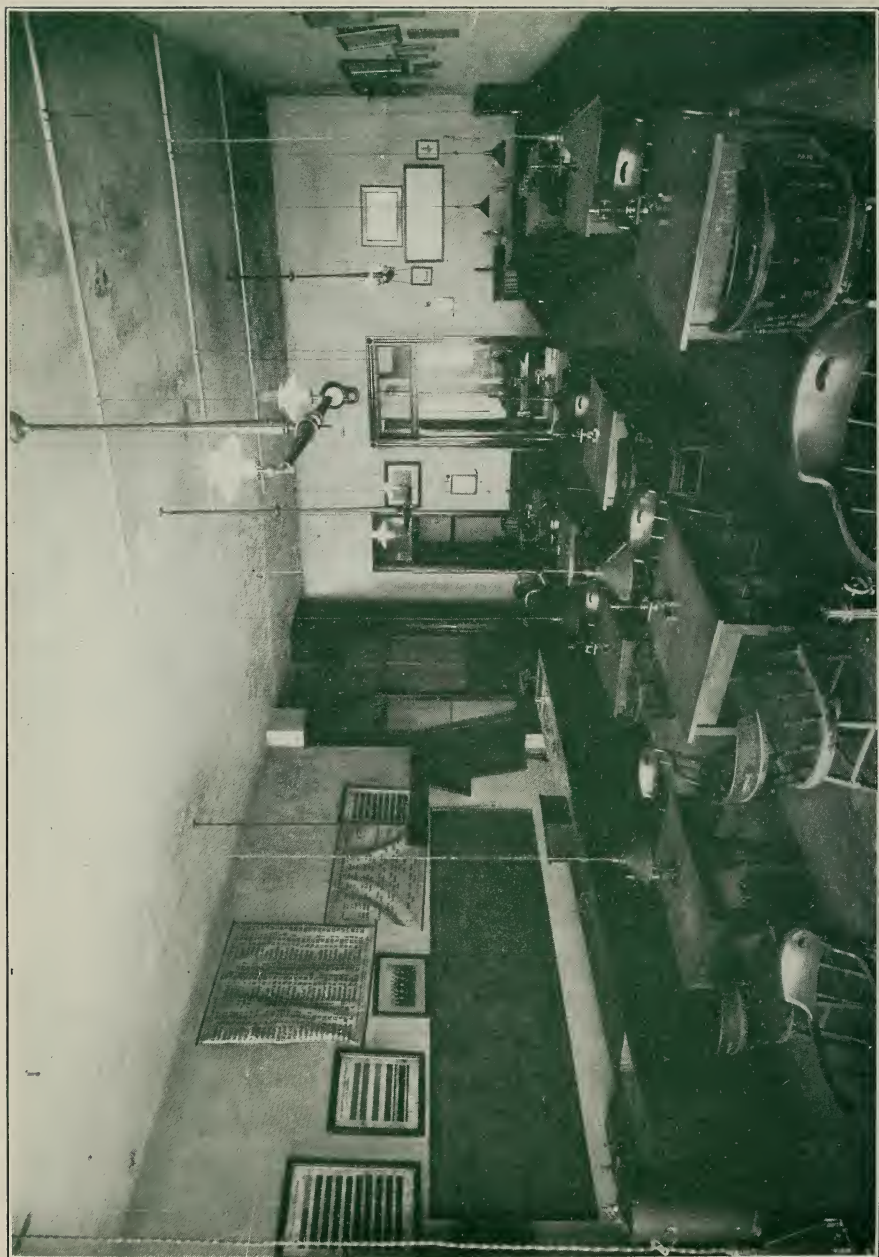
3. Numerical aperture, mechanism of compound microscopes, micrometry of simple lenses, of compound microscopes.

4. Laboratory tests for focus, determination of magnification in magnifiers, in compound microscopes.

5. Micrometry work.

6. Study of starches: Wheat, potato, arrowroot, corn, rice, cassava, rye.





A SECTION OF MICROSCOPICAL LABORATORY.

7. Woods: Elements constituting woods, in angiosperms, in gymnosperms.
8. Woods: Quassia, yellow sandal wood.
9. Microchemical tests: For cellulose, for lignified tissue.
10. Types of calcium oxalate crystals.
11. Stems: Lobelia stem, dulcamara stem.
12. Leaves: General histology of.
13. Leaves: Senna, buchu, tea, hyoscyamus, mullein.
14. Barks: General histology of.
15. Barks: Oak, cascara, cinnamon.

#### SENIOR COURSE.

1. Seeds: Structure, embryo, coverings, reserve materials.
2. Seeds: Mustard seed, linseed, coffee, nux vomica.
3. Fruits: Cardamom fruit, capsicum, pepper, wheat.
4. Rhizomes: General structures.
5. Rhizomes: Arnica, ginger.
6. Roots: Dandelion root, chicory, ipecacuanha.
7. Some common adulterants: Coconut shells, olive pits, cracker crumbs, turmeric.
8. Practical work: Consisting of practical work in the identification of mixtures of substances which have been studied during the Junior and Senior courses.

## MATERIA MEDICA, BOTANY AND TOXICOLOGY

PROF. HENRY H. HAZEN.

#### SENIOR COURSE.

1. General review of last year's work.
2. Drugs to reduce irritability of respiratory center.
3. Drugs to increase bronchial secretion.
4. Drugs to relax bronchial spasm.
5. Nervous stimulants.
6. } Nervous depressants.
7. }
8. Analgesics.
9. The coal tar group.
10. Drugs specific for certain diseases.
11. Drugs affecting perspiration.
12. Drugs affecting the eye.
13. Drugs affecting the skin.
14. Digestive ferments. Bile.

15. Intestinal secretions.
16. Toxins and anti-toxins.
17. Vaccines. Bacterins.
18. Visit to laboratory producing biological products.
19. Drugs used hypodermically.
20. Introduction to toxicology.
21. Local poisons.
22.     }
23.     }
24.     }

Systemic poisons.

## PHARMACY.

PROF. HENRY E. KALUSOWSKI.

### SENIOR COURSE.

1. Cellulose Group. Products obtained directly and by destructive distillation. Coal-tar products under this head will be specially treated. A number of preparations classed under the general term of "synthetics," tests for identification and their purity will be considered.

2. Amylaceous, Mucilaginous and Saccharine substances as such, and their more important products, will be taken up and noted according to their value.

3. Derivatives of Sugars through action of ferments. Alcohols and Ethers. Methods by which they are obtained; purification tests for identification and purity.

4. Aldehyde; its derivatives, preparations and tests.

5. Products obtained by the action of ferments upon Acid and Saccharine Fruits.

6. Soaps. Methods and theory of saponification, purification of by-products.

7. Volatile Oils, Sources. Composition of the more important kinds as shown by recent investigations. Tests for identity and assay methods.

8. Products obtained from Resins, Balsams and Gum Resins. Methods of separation and production in a state of pharmaceutical purity; tests.

9. Methods for producing Resenoids with remarks on their relations to the medicinal properties of the drug from whence they are derived and the system of their nomenclature.

10. Pills. Methods of making masses; hardness and coherence of the same; how regulated by excipients; choice of excipients and functions of absorbing powders; treatment of oils and other liquids in making masses; division and shaping mass into pills; finishing and dusting pills; choice of dusting powders.

11. Pill Coating, Sugar, Gelatine, Chocolate and Foils. Methods for and composition of coating materials.

12. Tablet Triturates. Composition; use of excipients; manner of division and methods for forming.

13. Capsules, Composition of. Manner of capsuling pills and powders; capsuling and dispensing liquids; solubility of capsules; conditions affecting the same; care in dispensing.

Wafers, Composition of. Methods for filling and dispensing.

14. Compressed Tablets. Methods followed in preparing the mass and compressing.



15. Troches, Masses and Confections. Medicaments adapted to that form of administration

16. Powders. Methods for securing uniformity of diffusion in simple and compound powders; dividing, folding and dispensing.

Treatment of Powders. Composed in part or whole of volatile, efflorescent, or deliquescent substances.

17. Suppositories. Hot and cold processes; use of molds; preparation of the mass; incorporating the medicaments; rolling and dividing, shaping; use of molds explained and demonstrated.

18. Plasters. Methods for preparing and spreading. Remarks on dispensing.

19. Ointments. Cerates and other bases for applying medicaments by contact or inunction; methods for preparing; use of heat; necessity for straining and purification from foreign matter; manner of incorporating solution of salts, waters, extracts and powdered substances; preservation of products and methods of dispensing. Oleates. Methods for making by direct combination; solution or decomposition; remarks on their character and qualities.

20. Milk, composition of; seasonal variation. Methods for testing for fats, albuminous substances, sugar, water.

21. Urinary Analysis. General remarks on normal and pathological constituents of urine; variations from normal interpreted; description and application of chemical tests; application and use of the microscope for examining urinary sediments; collection of sediments and methods for mounting described and demonstrated.

Review at the close of the first half of the course and at the end of the last half of the course.

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## PHARMACEUTICAL LABORATORY WORK.

### SENIOR.

1. Percolation, Various methods of. Applied to making a series of fluid, solid extracts and powered extracts.

2. Recovery of alcohol from exhausted drugs and weak percolates; determination of the percentage of alcohol in the recovered liquid; instruction for converting it into diluted alcohol of other required strength.

3. Pills, Powders, Capsules, Wafers, Tablet Triturates. Students in this section will be expected to make up a series of these preparations, and will be instructed in the manner of making and methods of dispensing. Pill coating will receive due attention.

4. Mixtures. Methods of preparing official and unofficial mixtures, emulsions of oils, gum resins; resins, liniments, and liquids that are insoluble in aqueous vehicles.

5. Granular Effervescing Salts. Methods for preparing and granulating. Compressed Tablets. Methods for preparing the mixture and compressing.

6. Continuing through this course instruction in prescription work will be given. It will include methods for compounding, and the attention of students will be directed to the details involved in dispensing, problems in deciphering illegible prescriptions, and the treatment of incompatibles, whether chemical, physical, or therapeutical, will receive the attention that their importance justifies. Students will be furnished with copies of prescriptions for compounding. The prescriptions will be selected with the view of presenting difficulties and incompatibilities ordinarily met with in the practice of Pharmacy.

7. Preparation of Scale Salts. This will begin by taking definite quantities of solution of tersulphate of iron, and following each step to the production of the finished scale.

8. Suppositories, Oleates, Plasters, Ointments and Cerates. Instruction in preparation and methods for dispensing.

9. Upon the conclusion of the work indicated in each section a laboratory examination will be held. It will involve the production of some compound or compounds included in any of the sections; the nature of the product or products required will be announced on the date of examination; necessary material for working will be supplied.

ANALYTICAL CHEMISTRY  
QUANTITATIVE ANALYSIS  
PROF. HOWARD M. BRADBURY  
SENIOR COURSE.

1. Quantitative analysis; gravimetric; volumetric; standard and normal solutions; indicators, theory and use of.
2. Apparatus used in volumetric analysis; care, use, methods of calibration and corrections applied.
3. Theory of solution. Principles of chemical combination as applied to problems in volumetric analysis.
4. Alkalimetry. Estimation of solution of potassium hydroxide and ammonia water by means of normal sulphuric acid V. S.
5. Estimation of samples of sodium carbonate by hot process. Direct titration.
6. Estimation of samples of sodium carbonate by residual titration employing empirical alkali solutions.
7. Estimation of ammonium carbonate by means of normal sulphuric acid V. S.
8. Standardization of hydrochloric acid by sodium carbonate.
9. Estimation of potassium and sodium tartrate by residual titration demonstrating the use of standard solutions not strictly normal or systematic.
10. Preparation of normal potassium hydroxide V. S., including standardization against potassium bitartrate as set forth in the pharmacopoeia.
11. Acidimetry. Estimation of diluted hydrochloric acid and sulphuric acid by means of normal potassium hydroxide V. S.
12. Analysis by precipitation. Estimation of potassium iodide and potassium cyanide by tenth-normal silver nitrate V. S.
13. Analysis by precipitation continued. Estimation of ammonium bromide in presence of chlorides by tenth-normal silver nitrate V. S.
14. Standardization of hydrochloric acid with silver nitrate.
15. Analysis by oxidation. Preparation of tenth-normal potassium permanganate V. S. and its standardization with metallic iron.
16. Preparation of tenth-normal potassium permanganate V. S. by mixing two solutions of different strengths in proportion based upon the quantity of each required to react with a definite quantity of tenth-normal oxalic acid V. S.
17. Estimation of ferrous sulphate by tenth-normal potassium permanganate V. S.
18. Estimation of solution of hydrogen dioxide for weight of absolute hydrogen dioxide and volume of oxygen.
19. Determination of ferrous and ferric iron in a solution of salts of each by means of tenth-normal potassium dichromate V. S.
20. Indirect oxidation or iodometric estimations. Preparation of tenth-normal iodine V. S. and its standardization with arsenic trioxide.
21. Preparation of tenth-normal sodium thiosulphate V. S. and its standardization against tenth-normal iodine V. S. Estimation of chlorine water.
22. Estimation of Labarraque's solution by means of tenth-normal sodium thiosulphate V. S.
23. Estimation of solution of ferric chloride by means of tenth-normal sodium thiosulphate V. S.
24. Estimation of sugar by Fehling's solution. Determination of glucose in syrups.
25. Estimation of solution of formaldehyde by means of fifth-normal potassium permanganate V. S., using residual titration method with empirical solution of peroxide of hydrogen (Free Zeit 40-587).
26. Practical laboratory examination





A SECTION OF CHEMICAL LABORATORY.



# GENERAL CHEMISTRY

## PROF. HERBERT H. BUNZEL

### SENIOR COURSE

1. Organic chemistry. Definition. General properties and common sources of organic compounds; methods of purification; physical constants and their application.
2. The elements more commonly found in organic compounds; methods of analysis; empirical, rational and structural formulas; isomerism; classification
3. The hydrocarbons—methane and ethane. Homologous series. Halogen derivatives of methane and ethane: Oxygen derivatives: Alcohols.
4. Methyl and ethyl alcohol. Fermentation. Ethers. Ethyl ether, mixed ethers.
5. Aldehydes of methane and ethane. Chloral. Acids: Formic and acetic acids; acid anhydrides. Structural relation between hydrocarbons, alcohols, aldehydes and acids.
6. Esters or ethereal salts. Ketones. Sulphur derivatives of methane and ethane.
7. Nitrogen derivatives of methane and ethane: Cyanogen, hydrocyanic acid, ferro- and ferri-cyanides, cyanides and isocyanides, cyanates and isocyanates, etc.
8. Substituted ammonias, amines or amino compounds. Nitro compounds. Metallic derivatives.
9. The marsh gas series of hydrocarbons or paraffins. Petroleum, its refining. Isomerism among the paraffins.
10. Oxygen derivatives of the higher members of the paraffin series; characteristics of normal, secondary, and tertiary alcohols. Higher aldehydes and fatty acids; soaps.
11. Polyacid alcohols and polybasic acids; oxalic acid, etc.; glycerine, fats, saponification.
12. Mixed derivatives of the paraffins. Hydroxyacids, glycolic, lactic, malic, tartaric, citric, saccharic, mucic acids, etc.
13. Carbohydrates: Glucoses, saccharoses; celluloses, gums. Polarization.
14. Mixed compounds containing nitrogen: Amido acids, acid amides. Unsaturated carbon compounds; ethylene, acetylene.
15. Aromatic compounds: The benzene series of hydrocarbons and derivatives. Theory of the benzene ring. Isomerism among benzene derivatives. Benzene, toluene.
16. Halogen substitution and addition-products of benzene; nitrobenzene, aniline, acetanilide, phenacetine, toluidine, diazo-compound, dyes, etc.
17. Phenols and cresols, creosote, picric acid, thymol, etc.
18. Benzyl alcohol benzaldehyde, benzoic acid, salicylic acid, etc. Naphtalene, anthracene.
19. Pyridine bases, terpenes, camphors, glucosides, vegetable and animal alkaloids, proteins.
20. Physiological chemistry: Chemical changes in plants and animals.
21. Physiological chemistry *continued*. Animal fluids and tissues.
22. Other sessions will include quiz and review-periods at appropriate intervals; also mid-year and final examinations.



## TEXT BOOKS.

Remington's Pharmacy, Cushney's Pharmacology. Gray's Elementary Botany; United States Pharmacopœia; Qualitative Chemical Analysis, Prescott and Johnson; Tanner's Poisons; Gage's Principles of Physics, Goodspeed's edition; Introduction to Inorganic Chemistry; Alexander Smith; Remsen's Introduction to the Compounds of Carbon; fifth revision; Simon's Manual of Chemistry; Scoville's Art of Compounding; Culbreth's Materia Medica and Pharmacology; Greenish, Foods and Drugs.

## BOOKS FOR REFERENCE.

Pharmaceutical and Medical Chemistry, Sadtler and Trimble, second edition, volume 1; Roscoe's and Schorlemmer's Chemistry; Taylor's Toxicology; Maisch's Organic Materia Medica; Bastin's Botany; United States and National Dispensatories, Incompatibles in Prescriptions, Ruddiman; Morphology and Histology of Plants, Rusby & Jelliffe; Caspari's Practice of Pharmacy; Pharmacology, Tyrode; Holland's Medical Chemistry and Toxicology; Text Book of Inorganic Chemistry by Holleman (Cooper); Text Book of Organic Chemistry by Holleman (Walker.)

## EXAMINATIONS.

The annual examination of students will begin on May 10, 1915, and continue upon such days as the Board of Examiners may determine.

Students intending to present themselves for the annual examination must exhibit to the Dean of the College on or before April 23, 1915, their lecture tickets, with a recommendation and a statement of attendance endorsed on the back thereof by the several members of the faculty. Candidates for graduation are required to deposit with the Dean the Diploma Fee, which will be returned in the event that the candidate is unsuccessful.

## CREDITS ON EXAMINATIONS FOR GRADUATION.

Students who fail to pass the final examination in all studies but are successful in two or more of them shall receive credit for those passed, provided they pass the examination in the remaining studies within two years thereafter; otherwise no credits will be allowed.

## THE DEGREE.

The Degree conferred by this College is that of *Doctor of Pharmacy*.

## QUALIFICATIONS FOR THE DEGREE.

1. He shall have attended three *courses of instruction* in Chemistry, Pharmacy, Analytical Chemistry, Materia Medica, Botany and

Toxicology, and two in Microscopy, *the last of which* must have been in this College; and one course each in Mercantile Pharmacy and Pharmaceutical Jurisprudence.

2. He must have passed a satisfactory examination in *each* of the branches taught.

3. He must be recommended by the Board of Examiners.

#### FEES.

Matriculation,	-	-	-	-	-	-	-	-	\$ 5 00
Tickets for the full year's course of instruction, Freshman	-	-	-	-	-	-	-	-	80 00
" " " " " " Junior,	-	-	-	-	-	-	-	-	85 00
" " " " " " Senior,	-	-	-	-	-	-	-	-	90 00
Single tickets for Materia Medica, Botany and Toxicology, each,	-	-	-	-	-	-	-	-	25 00
" " " Analytical Chemistry,	-	-	-	-	-	-	-	-	25 00
" " " Chemistry,	-	-	-	-	-	-	-	-	25 00
" " " Practical Pharmacy,	-	-	-	-	-	-	-	-	25 00
" " " Microscopy,	-	-	-	-	-	-	-	-	25 00
" " " Mercantile Pharmacy,	-	-	-	-	-	-	-	-	10 00
" " " Pharmaceutical Jurisprudence,	-	-	-	-	-	-	-	-	10 00

*Fee for Diploma, \$10.00.*

#### SINGLE TICKETS.

Students who desire may select one or more of the branches taught, and upon payment of the fee for single tickets, attend the lectures and laboratory work during the time set apart for such study.

Students taking single tickets will not be entitled to take the examinations for the degree conferred by the College.

Students will not be allowed to attend any course of instruction unless they are provided with the proper tickets. Tickets will be accepted for the course of lectures only for which they are issued. Students failing in the examination for graduation will be required to take out tickets for and attend instructions at least one year in such studies as they fail to receive credit for before they will be given another examination.

A deposit of \$3.00 to cover loss by breakage, etc., will be required in each of the two Laboratory Courses. A deposit of \$5.00 will be required of special students in the Analytical Laboratory. Any balance remaining to the credit of the student at the end of the school year will be returned if applied for within one year after the end of the term *and all dues to the College have been paid.*

Tickets can be obtained from the Dean of the College, to whom application for information should be made.

H. E. KALUSOWSKI, Dean,

808 I Street, N. W., Washington, D. C.

## UNDERGRADUATES.

1913-1914

ADAMS, WM. S., D. C.	KERFOOT, GARLAND S., Va.
ARNOLD, HOWARD, Va.	LEON, MANUEL C., Cuba.
BLUE, NORMAN R., D. C.	LAWSON, JAMES H., N. C.
BORLAND, ANNA MAY, Mich.	LEAR, ISRAEL, Russia.
BROWN, ANDREW J., N. C.	LANTZ, SAMUEL A., Va.
COLAHAN, JOHN T., Md.	MINNICK, GEORGE V., Pa.
CRISP, THOMAS BENTON, Jr., D. C.	McCAMBRIDGE, JOSEPH A., D. C.
DAVIS, GEORGE A., D. C.	MALONE, WM. W., D. C.
DAVIS, LOUIE G., Va.	MINKIN, ABRAHAM J., Russia.
DAVIS, PAUL R., Pa.	MODENA, ERVIN, Va.
DUDLEY, JAS. W., D. C.	MOORE, GEORGE KELLEY, N. C.
DONAHUE, FRANCIS T., D. C.	NORRIS, EARL M., Md.
DAY, HAROLD LEWIS, D. C.	PAINTER, ARCHIE S., D. C.
FRAILEY, WILLIAM F., Md.	PICOT, SCABORO, C., N. C.
FINK, JAMES ALBERT, D. C.	ROS, CARLOS M., Panama.
GAINES, JOHN MARSHALL, Va.	ROSENBERG, LEWIS CHARLES, Conn.
GOLDSTEIN, MORRIS G., Russia.	STEWART, WILLIAM A. T., Idaho.
HOLMES, KATE S., Ohio.	TIBBETS, LYMAN B., D. C.
HELLER, THEO. J., D. C.	UMHAU, JOHN W., D. C.
JOHNSON, P. MARSHALL, Va.	VESTAL, PAUL W., N. C.
KIMBALL, CLARENCE B., N. C.	WILLIAMS, CLYDE G., Pa.
KLOCZEWSKI, ALBERT M., D. C.	WEIL, ALBERT, Va.



## STUDENTS TAKING SPECIAL COURSES.

1913-1914

BIGGINS, JAMES J., D. C.	LINDEN, WILLIAM V., Ind.
BLUE, NORMAN R., D. C.	A. M. Ohio State University
DORAN, JAMES M., N. Dak.	MILLER, HENRY M., Ky.
S. B. University of Minnesota	S. B. Hanover College.
FITZGERALD, F. F., D. C.	McKENNON, EMORY F., Ohio.
FOSTER, ALLEN, Jr., D. C.	McARTHUR, JOHN E., Kans.
FEGAN, FRANCIS, E., D. C.	PAYEWSKI, PETER J., Russia
HEMP, HARRY, D. C.	PAYLOR, RUSSEL S., N. C.
KIEFER, RALPH S., Pa.	WEDDING, WILLIAM C., D. C.
KENNER, HARRY R., D. C.	



## GRADUATES.

1914

BIGGS, JOHN G., D. C.	HALL, EARLE R., Nebr.
BLACKISTONE, BEULA L., Calif.	KOSS, EDWARD F., D. C.
BURGHER, VINCENT A., N. J.	MURPHY, JOHN A., Pa.
CARROLL, JOHN A., D. C.	LL. B. G. U. 1909.
DONOHUE, WALTER J. A., N. Y.	STEPHENS, WM. A., Ky.
DUDLEY, FRED'K E., Jr., D. C.	WALDMAN, JACOB, Russia.

William S. Thompson Memorial Scholarship awarded to Morris G. Goldstein, Russia.  
John A. Milburn Memorial Scholarship awarded to Earle Richardson Hall, Nebr.

# ALUMNI.

NOTE.—Those having a \* before their names have received certificates, and not the degree conferred by the College. Those having a † before their names are deceased.

## HONORARY MEMBERS.

†B. F. CRAIG, M. D.	†JOHN A. MILBURN
†OSCAR OLDBERG	CHAS. BECKER.
†RICHARD H. STABLER, M. D.	WM. HALLOCK.
†EDWARD T. FRISTOE, LL. D.	†W. G. DUCKETT.
J. EDWARD WHITFIELD.	†GILES G. C. SIMMS.
†WILLIAM S. THOMPSON.	†RANDOLPH L. ELIOT.
HENRY A. JOHNSTON.	WILLIAM F. HILLEBRAND.
FREDERICK A. HOLTON.	†A. J. SCHAFHIRT.
FRANK P. WELLER	

## CLASS 1873

C. R. DUFOUR, D. C.	†WM. B. HEISKILL, Pennsylvania.
ALBERT M. READ, Michigan.	
1874	T. P. COLE, D. C.
†F. C. GAITHER, D. C.	
†C. LEROY SAYRE, New York.	
1875	H. E. KALUSOWSKI, D. C.
A. S. TABER, New York.	†W. F. SCALA, D. C.
E. M. TABER, New York.	
1876	J. SNIDER NOEL, Maryland.
HENRY ADAMS, Massachusetts.	†D. F. OWENS, Maryland.
FRANK PITZER, Virginia.	
1877	†T. E. CHIDESTER, Ohio.
†T. M. COOMBS, D. C.	†JOHN J. STAFFORD, Maryland.
†T. G. DEMOLL, D. C.	
†C. G. DULIN, D. C.	
1878	I. B. ROBERTSON, New York.
C. M. BALL, Virginia.	
F. McC. CRISWELL, D. C.	
1879	T. A. T. JUDD, Virginia.
SAMUEL BOWER, New York.	WM. E. SHAFFER, D. C.
HARRY W. HODGES, Georgia.	HARRY STANDIFORD, Virginia.
NELSON HEAD, Virginia.	
1880	†ANDREW F. HOFER, Pennsylvania.
THOS. G. MCGORK, California.	EDWIN GLADMON, D. C.
LOUIS KOLIPINSKI, D. C.	GEORGE W. BOYD, D. C.
†M. MUNCASTER, Maryland.	
1881	WM. HINRICHS, Germany.
CHAS. ROSCOE LUCE, New York.	
C. P. KEARFOOT, West Virginia.	
1882	HENRY EVANS, England.
GEORGE E. DOERING, D. C.	†LEWIS C. MILBURN, Virginia.
FRANK C. HENRY, D. C.	EDWARD P. MERTZ, D. C.
S. EDGAR MAHAN, Delaware.	
†JOS. R. WALTON, M. D., England.	
1883	WM. T. CRISWELL, D. C.
ALEX. MUNCASTER, Maryland.	JAMES A. WATSON, Virginia.
JOHN C. FIRMIN, Massachusetts.	ALBERT E. ACKER, D. C.
†WM. S. THOMPSON, Jr. D. C.	†CHARLES F. KEIM, Pennsylvania.
†E. CHESTER STOTT, D. C.	
1884	GEORGE J. LOCHBOEHLER, Missouri
†EDWARD R. BIGELOW, Ohio.	LAIDLER MACKALL, D. C.
LEWIS FLEMER, D. C.	
B. B. OWEN, Maryland.	
1885	ALBERT A. LAWRENCE, Ohio.
JAS. F. R. APPELEY, D. C.	WM. K. MITCHELL, D. C.
CHARLES A. BECKER, New York.	†ALFRED MOSS, Virginia.
R. BENNETT, Ireland.	E. C. F. A. SCHAEFER, Germany.
G. R. LEE COLE, Virginia.	HERMAN B. WADDY, Virginia.
JOS. A. HORGAN, D. C.	
1886	W. G. ALDRIDGE, Virginia.
R. L. LYNCH, D. C.	ED. V. CONNER, D. C.
CONRAD WEISS, D. C.	F. HAFELFINGER, New York.
†MAX KOCH, Illinois.	C. H. FRANZONI, D. C.
FRANCIS ST. CLAIR, New York.	H. W. SESSFORD, D. C.
W. C. NESS, D. C.	
1887	E. F. SICKENBERGER, Egypt.
E. GEO. BECKER, Germany.	†W. L. SKINNER, Virginia.
†CARL L. CLUSS, D. C.	SAMUEL T. STOTT, D. C.
HERBERT C. EASTERDAY, Virginia.	JOHN E. TONER, D. C.
†O. R. LATHAM, Pennsylvania.	E. W. WHITESIDE, Maryland.
E. N. MATTHEWSON, Pennsylvania.	†W. E. WOLHAUPTER, D. C.
J. A. RIGGS, Maryland.	



†HIRAM J. BANES, Pennsylvania. 1888  
 ARTHUR B. BURROWS, New York.  
 HUGH M. CLINE, Maryland.  
 WM. B. CULVERWELL, D. C.  
 V. H. EISENBEISS, D. C.  
 †FRANK D. EVANS, D. C.  
 WM. H. FREY, D. C.  
 CHARLES E. GROSS, D. C.  
 CHAS. HAWKINS, England.  
 GEO. W. HURLEBAUS, D. C.  
 EDWARD A. HELMSEN, D. C.

EDWARD BOYD, D. C.  
 J. S. CLEMENCE, D. C.  
 WM. EMORY, Pennsylvania.  
 W. W. FISHER, Pennsylvania.  
 C. J. GILLETTE, New York.  
 S. T. GRIMES, Maryland.

†ISAAC ALLEN, Delaware.  
 ROBERT C. DICKINSON, Pennsylvania.  
 MATTHEW B. DONNELLY, D. C.  
 CHARLES EARL, Massachusetts.  
 WALTER S. FERRIS, New York.  
 †MONTE GRIFFITH, Virginia.  
 CALVIN B. HEIZER, Virginia.  
 R. VERNON HOUSTON, D. C.  
 †PERCY G. McCOMAS, Maryland.

EDWARD F. ALBERT, Pennsylvania. 1891  
 CHARLES E. BALDWIN, Iowa.  
 ALFRED T. BRONAUGH, Virginia.  
 CHAS. B. CAMPBELL, Pennsylvania.  
 †J. EDWARD CARROLL, D. C.  
 ALBERT J. COX, Virginia.  
 FRANCIS C. HAINES, D. C.  
 JAMES W. HARPER, Virginia.  
 HENRY S. HERR, Illinois.  
 HARRY D. HUTTON, D. C.

JAMES T. ARWINE, Indiana.  
 EDWARD J. BASTABLE, D. C.  
 ALBERT N. CONNER, Virginia.  
 WM. M. JOHNSON, D. C.  
 W. P. M. KING, D. C.  
 GEORGE T. MANKIN, Virginia.

WYMOND H. BRADBURY, New Jersey. 1893  
 HENRY BUDENBOM, Indiana.  
 \*CHARLES L. EBAUGH, Mo.  
 †ARTHUR CASE FITCH, New York.  
 †HENRY R. GARLAND, Virginia.

1894  
 PHILLIP J. AFFLECK, Jr., Virginia.  
 J. THOMAS BAILEY, Maryland.  
 MELVILLE L. BRADFORD, D. C.  
 †CHARLES H. BLUMER, D. C.  
 JULIUS S. BUYNITZKY, D. C.  
 NEWTON EDMONDS, D. C.  
 ERNEST T. FEARON, Pennsylvania.  
 THORNTON B. FISHER, D. C.  
 WALTER R. HILL, D. C.  
 HARRY T. L. HOYLE, D. C.  
 BERTRAM A. JOHNSON, D. C.  
 V. MASON JOHNSON, Virginia.  
 CHRISTIAN L. KRAUS, D. C.  
 \*HARRY B. KREBS, Pennsylvania.

\*MAX GEORGI, Minnesota. 1895  
 CHARLES W. HOGAN, Maryland.  
 JOHN LEADBEATER, Virginia.

1896  
 \*HUGH M. ADAMS, Pennsylvania.  
 HARRY P. BAKER, D. C.  
 †LON BUDENBOM, Indiana.  
 MARION E. BULLOCK, Kansas.  
 LANGDON S. DAY, Maryland.  
 †HARRY T. DODGE, D. C.  
 VICTOR H. ESCH, D. C.  
 W. CALHOUN FURR, Virginia.  
 RICHARD GIBSON, Virginia.  
 \*HARRY L. GOULD, D. C.  
 GEORGE LATTENER, D. C.

SAMUELL. HILTON, D. C.  
 CHAS. G. LENNON, Virginia.  
 A. P. LOHNES, D. C.  
 †JOSEPH L. MAXWELL, D. C.  
 MILTON P. MILLER, Virginia.  
 FRANCIS PETROLA, D. C.  
 GEORGE SCALA, D. C.  
 F. B. SEVERANCE, Massachusetts.  
 †WILLARD M. SISSON, D. C.  
 FRANCIS WOOD, New York.

1899  
 W. P. HERBST, Pennsylvania.  
 J. S. HIGDON, Maryland.  
 ROBERT L. WREN, Virginia.  
 M. H. MENKE, D. C.  
 C. J. ORDING, Illinois.  
 †GEO. B. WEISS, D. C.

COURTLAND D. OWENS, Pennsylvania  
 MALVERN H. PRICE, Virginia.  
 R. LUCIEN QUIGLEY, Pennsylvania.  
 †WALTER B. RAUB, D. C.  
 W. ROBERT SHAW, D. C.  
 B. OGLE TAYLOR, Virginia.  
 †D. JAMES TENNANT, D. C.  
 MORRIS W. WATERS, D. C.  
 JAMES V. YATES, Jr., D. C.

1891  
 ALBERT B. HYATT, Maryland.  
 JOHN W. JENNINGS, Virginia.  
 FRANK V. JOHNSON, D. C.  
 CHARLES MACGREGOR, Virginia.  
 †WILLIAM G. ROE, Pennsylvania.  
 †WILLIAM J. RYDER, New York.  
 CHARLES SCHERER, D. C.  
 ALFRED H. WELLS, Maryland.  
 GILPIN WILLSON, Maryland.  
 †ROBERT C. WILLIAMS, Virginia.

1892  
 SMITH C. PEDIGO, Texas.  
 ADOLPHUS E. POWELL, Virginia.  
 TOM N. PHILLIPS, Colorado.  
 Miss JENNIE M. REIGART, Colorado  
 FELIX A. VAN REUTH, D. C.  
 HARRY A. YATES, Virginia.

1893  
 GEORGE J. GEIGER, D. C.  
 †WILLIAM E. HALLORAN, D. C.  
 DANIEL D. MULCAHY, D. C.  
 \*WILLIAM S. UDALL, Vermont.  
 FRANK C. WILSON, Ohio.

1894  
 ALFRED H. KEIM, Virginia.  
 JOHN A. KOCH, Illinois.  
 M. C. K. LUPTON, D. C.  
 QUENTIN MACKALL, D. C.  
 HERBERT D. MEEK, Pennsylvania.  
 CHARLES C. MUSSINA, Pennsylvania  
 GUY M. NEELY, Pennsylvania.  
 EUGENE R. NICHOLS, D. C.  
 \*TERRY OLESON, Minnesota.  
 LOUIS RUBENSTEIN, D. C.  
 THOMAS J. SHERIDAN, D. C.  
 MORGAN L. STEELE, N. Y.  
 ROBERT A. VEITCH, Maryland.

1895  
 FRED B. HASKINS, D. C.  
 †JAMES A. JENNINGS, Virginia.

1896  
 †CHARLES W. LITTLE, Kansas.  
 JOHN T. MURPHY, Wisconsin.  
 †ARTHUR L. ORRISON, Virginia.  
 HARRY M. PRICE, D. C.  
 \*JENNIE T. RUGG, Massachusetts.  
 †CHARLES G. SANDERS, Mo.  
 DANIEL F. SLATTERY, D. C.  
 ODEN R. SUDLER, D. C.  
 M. R. WOOLDRIDGE, D. C.  
 C. HOWLE YOUNG, D. C.



# 1897

\*ALEXANDER LEWIS BOGAN, D. C.  
HARVEY D. BOWDEN, New Jersey.  
\*CLIFTON POWER CLARK, Miss.  
CLIFFORD S. DUNCAN, Illinois.  
MARTIN S. FEALY, D. C.  
JOSHUA L. GATCHEL, D. C.  
JOHN MURRAY HACKETT, New York.  
WILLIAM H. HOUGH, Kansas.  
JOHN W. HOUSTON, Pennsylvania.  
WILLIAM P. KENEALY, D. C.  
†ARTHUR H. F. LUERSEN, D. C.

# 1898

†EDWARD ALVA DUCKETT, D. C.  
BARRON R. FRANKLIN, Va.  
CHARLES I. GRIFFITH, D. C.  
\*KIRK HOLMES, N. Y.  
PRESTON C. KING, D. C.  
\*LUCRETIA B. LACY, Ill.  
CHARLES A. McAVOY, D. C.  
E. L. MASON, Va.

# 1899

LOUIS FRANCIS BRADLEY, Va.  
CHARLES J. FUHRMANN, Mich.  
JOHN S. GALLAGHER, D. C.  
PAUL L. JOACHIM, D. C.  
GEORGE DEXTER KEHOE, Ky  
FRANK B. KETCHUM, Mich.

# 1900

CHARLES GARRELS, Ill.  
FLORENCE VIRGINIA HOSKINS, D. C.  
J. WILLARD McCHESNEY, D. C.  
JOHN M. MINICK, Pa.  
ERNEST PANSONS, D. C.  
†WILLIAM A. WOODFIN, Tex.

# 1901

ALEXANDER SHIRAS DAGGETT, N Y.  
F. PERKINS DEWEY, Jr., Tenn.  
PETER JOSEPH DUNCAN, Conn.  
JOSIAH H. HOLLAND, D. C.  
\*CHARLES E. HOUGHTON, Mass.  
ADAM KEMBLE, Pa.  
WILLIAM T. KERFOOT, Jr., Va  
\*FRANK A. TUCK, Va.

# 1902

HOWARD M. BRADBURY, Pa.  
JOHN F. BUTLER, D. C.  
MANLEY J. CLARK, N.Y.  
FRANK R. DAVIS, Ky.

# 1903

W. EVEREST BOYER, Md.  
WILLIAM A. BRIGGS, Ill.  
†HARRY A. CANDEE, Ill.  
LOUIS B. CASTELL, D. C.  
THOMAS E. GIBB, Scotland.  
WILLIAM P. HABEL, Pa.  
HARRY E. HARVEY, Ohio.

# 1904

J. FOSTER ALLISON, Ill.  
ISADORE B. COHEN, D. C.  
FREDRICK Y. DONN, D. C.  
WILBUR S. HAUER, D. C.  
CLAUDE E. KOSS, D. C.

# 1905

JOSEPH F. ARTH, D. C.  
MATTHEW J. BEISTLE, Mich.  
FRED B. CAMPBELL, Va.  
ALBERT P. CLARK, Pa.  
†ROBERT G. HARVEY, Ohio.  
SYLVERN LAUPHEIMER, Va

# 1906

†FREDERICK C. BENNETT, England.  
ADDIE P. S. CRISWELL, D. C.  
LOUIS V. DIETER, Md.  
ALICE WINANS DOWNEY, Ohio.  
ISADORA GEOGHEGAN, D. C.  
MILTON L. GOLDSMITH, D. C.  
JOHN W. GRADY, D. C.  
BERNARD S. JUDD, D. C.  
BERNARD B. LARRICK, Va.

\*CLARKE J. MORRISON, Indiana.  
W. ROBERT PERKINS, D. C.  
JOHN MATTHEW PULLIAM, Virginia  
\*ALEX. HANSON QUARLES, Georgia.  
HENRY WRIGHTSON SMITH, Virginia  
HARRY C. SNYDER, D. C.  
JOHN P. THOMPSON, D. C.  
FRANK BROUGHTON TIPTON, D. C.  
CHARLES S. WALTER, D. C.  
OTTO F. WELLENREITER, Illinois.

SALVADOR D. MOORE, D. C.  
ALPHONSUS A. O'DONOGHUE, Me  
FRANK C. PURDUM, Md.  
FRANK R. RICHARDSON, Ohio.  
ISAAC SCOTT, D. C.  
ANDREW J. SHERIDAN, D. C  
LLOYD T. TAYLOE, Va.

TIMOTHY T. LANE, D. C.  
FRED A. MALTBY, D. C.  
ARTHUR W. PARKER, D. C.  
\*FRANK J. PHELPS, Pa.  
SAMUEL A. A. RICHARDSON, Ohio

HERBERT W. POOLE, Va.  
SAMUEL P. RICKARDS, Pa.  
†DeHAVEN SHARP, D. C.  
S. MASON WAGNER, W. Va.  
H McCOY WALTERS, Ill.

J. ARTHUR KLINGER, Pa.  
JOHN KRAUS, D. C.  
W. FENWICK MATTINGLY, Md.  
HELEN M. PROCTOR, Vt.  
FREDERICK REPETTI, D. C.  
JESSE A. SIMPSON, Md.  
THOMAS STRETTON, England.

PRESTON C. DAY, Md.  
MALCOLM G. GIBBS, Tenn.  
H. K. KIRBY, Va.  
LAWRENCE P. NOLAN, Md.

FRANCES P. HUTCHINSON, D. C.  
LEWIS H. LAMB, D. C.  
\*HENRY C. LEHMANN, D. C.  
W. J. McNAMEE, Pa.  
WILLIAM A. MESS, Ind.  
BENJ. F. SHOWALTER, Va.  
WILLIAM F. WORK, D. C.

JOHN J. McLOONE, Ireland.  
CHARLES C. READ, Pa.  
JOSEPH C. WILLIAMS, Md.  
JAMES B. WINGATE, Md.  
ALFRED WOLLBERG, Pa.

JOHN C. PEACOCK Md.  
SAID T. SAMAHA, S/ria.  
CHARLES C. SMALL, Ohio.  
ELMER L. SPITTLE, Va.  
ELIJAH W. TITUS, Va.  
†GEORGE S. WEBB, Minn.

FRANK T. LINTON, Md.  
HARRY S. McAULEY, D. C.  
DANIEL J. MATTINGLY, Md.  
ROBERT R. MISKIMON, Del.  
CYRUS W. NELSON, Iowa.  
AGNES M. NORDEMAN, Ills.  
HELEN HAZEL NORDEMAN, Ills  
NELLIE G. O'DONNELL, D. C.  
HELEN A. SUDLER, Ills.

# 1907

HERMAN H. COLBY, Germany.  
WILLIAM H. CANTWELL, D. C.  
†BERT V. CUPPERNELL, Ills.  
JOHN R. JACOBS, New York.  
JOHN T. KEISTER, Va.  
CLAUDE J. KEM, Colo.  
LOUIS LAUBINGER, Germany.

ROBERT F. TROXLER, Kentucky.

HAROLD H. LANTZ, Va.  
ROBERT EMMETT MADIGAN, D. C.  
STELLA C. NELSON, Oklahoma.  
ANDREW J. O'NEILL, D. C.  
BENNO K. PREUSS, Texas.  
LOUIS SACHS, Germany.  
W. BURTON SPIRE, New York.

# 1908

W. R. BOYER, Md.  
CARROL G. DEMING, D. C.  
HENRY B. FLOYD, Arkansas.  
MORRIS A. POZEN, Russia.

ROBERT B. SPENCER, N. C.  
ERNEST H. STEELE, Va.  
TAYLOR O. TIMBERLAKE, Va.  
WILLIAM D. THORN, D. C.

# 1909

RAY T. BAILEY, D. C.  
T. QUINN JONES, Md.  
EDWARD V. PAYNE, Va.

CHAUNCEY C. REESE, Md.  
IRENE NELLIE RICHARDSON, D. C.

# 1910

GEO. W. F. BOYD, D. C.  
ELIAS ELVOVE, B.S., M.S., Pa.  
J. D. A. HOGAN, D. C.  
RALPH A. JUDD, D. C.  
ALBERT W. KENNER, Maes.  
J. HAROLD MORGAN, Md.  
FRANR W. MILBURN, Va.

JAMES I. NOLAN, Ills.  
PAUL E. PLUNKETT, Md.  
DAVID B. PETERS, Va.  
NAOMI E. RICHARDSON, D. C.  
MARY H. RICHARDSON, Ohio.  
JULIA H. STROBEL, D. C.  
MELVILLE B. TEWKSBURY, Kan.

DOUGLAS TSCHIFFELY, Md.

# 1911

HOMER K. BUTLER, Md.  
EORING W. BEESON, Iowa.  
WILLARD DAY BOYER, Md.  
RALPH W. FELLER, Va.  
THEODORIC L. GILL, Va.

CHARLES B. GASS, Md.  
CHARLES W. HENDERSON, Va.  
GAIL E. NELSON, B. S., So. Dak.  
WILLIAM SIDNEY JONES, Va.  
CARL F. SNYDER, D. C.

CHARLES WHITEBREAD, Wisc.

# 1912

ANDERSON, GRACE L., Mo.  
DAMMEYER, C. F. W., Jr., Md.  
ELLIOTT, EDNA T., Mich.

HENRY C. W., N. C.  
NORTON, WM. H., Wash.  
SCHOMMER, JOHN B., LL. B., Wis.

THYSON, LEO C., D. C.

# 1913

BARKER, CHAS. W., Cal.  
CHAMBLIN, RALPH V., Va.  
HOHBERGER, SAMUEL I., Md.  
KINSEY, RAYMOND D., D. C.  
MIX, ANNA E., Md.

MAXWELL, DAVID L., Tenn.  
SMEYSER, BERT A., Pa.  
SWANN, EDWIN G., Md.  
TENNYSON, IRVING A., Va.  
WHITTLESEY, WILLIAM H., Ohio

WHITLEY, LAWRENCE B., N. C.

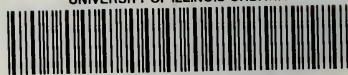
# 1914.

BARKER, CHAS. W. Calif.  
CHAMBLIN, RALPH V., Va.  
HOHBERGER, SAMUEL J., Md.  
KINSEY, RAYMOND D.- D. C.  
MIX, ANNA E., Md.  
MAXWELL, DAVID L., Tenn.

SMEYSER, BERT A. Pa.  
SWANN, EDWIN G., Md.  
TENNYSON, IRVING A., Va.  
WHITTLESEY, WILLIAM H., Ohio.  
WHITLEY, LAWRENCE B., N. C



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